

IN THE CLAIMS

1. (currently amended) A cartridge for sensing at least one analyte in a sample, said cartridge comprising:

a sample holding chamber for receiving said sample and retaining said sample;
a first conduit connected to said sample holding chamber;

at least one analyte sensor, wherein said sensor comprises an analyte-responsive surface and said surface is within said first conduit;

a second conduit for retaining a fluid, said second conduit connected to said first conduit at a junction;

means for inserting at least one air segment into said first or second conduit; and

pump means capable of displacing said sample from said holding chamber into said first conduit, said pump means further capable of displacing said fluid from said second conduit into said first conduit.

2. (currently amended) A cartridge for sensing at least one analyte in a sample, said cartridge comprising:

a sample holding chamber for receiving said sample and retaining said sample;

a first conduit connected to said sample holding chamber;

at least one analyte sensor, wherein said sensor comprises an analyte-responsive surface and said surface is within said first conduit;

a second conduit for retaining a fluid, said second conduit connected to said first conduit at a junction;

a valve connected to an opening in said first conduit, wherein said valve is closed by contact with said sample; and

pump capable of displacing said sample from said holding chamber into said first conduit, said pump further capable of displacing said fluid from said second conduit into said first conduit.

3. (currently amended) A cartridge for sensing at least one analyte in a sample, said cartridge comprising:

a sample holding chamber for receiving said sample and retaining said sample;

a first conduit connected to said sample holding chamber;

at least one analyte sensor, wherein said sensor comprises an analyte-responsive surface and said surface is within said first conduit;

a second conduit for retaining a fluid, said second conduit connected to said first conduit at a junction;

a valve connected to an opening in said first conduit, wherein said valve is closed by contact with said sample;

means for inserting at least one air segment into said first or second conduit; and pump capable of displacing said sample from said holding chamber into said first conduit, said pump further capable of displacing said fluid from said second conduit into said first conduit.

4. (original) The cartridge as in claim 1, 2, or 3, further comprising at least one sensor capable of detecting an air-liquid interface.

5. (original) The cartridge as in claim 1, 2, or 3, wherein said cartridge is single-use.

6. (original) The cartridge as in claim 1 or 3, wherein said segment is a single segment or a plurality of segments.

7. (original) The cartridge as in claim 1 or 3, wherein said segment is inserted into said first conduit.

8. (original) The cartridge as in claim 1 or 3, wherein said segment is inserted into said second conduit.

9. (original) The cartridge as in claim 4 wherein said at least one sensor capable of detecting an air-liquid interface is a conductimetric sensor.

10. (original) The cartridge as in claim 1, 2, or 3, wherein said cartridge further comprises a metering means for delivering a metered amount of said sample to said at least one analyte sensor.

11. (original) The cartridge as in claim 10 wherein said metering means comprises a capillary stop within said first conduit.

12. (original) The cartridge as in claim 1 or claim 3 wherein said means for inserting at least one air segment is selected from the group consisting of an air sac comprising a pneumatic means for displacing air from said air sac into said second conduit, a dry chemical that produces a gas when dissolved, a plurality of electrolysis electrodes operably connected to a current source, a porous means that absorbs fluid displacing air from said porous means into said conduit, and a vent that permits an air segment to enter the fluid when said pump means moves said fluid.

13. (currently amended) The cartridge as in claim 2 or claim 3 wherein said closeable valve is selected from the group consisting of a dry sponge material coated with a fluid impermeable layer, a flap capable of blocking said valve and held open by a dry soluble compound, and ~~or~~ a gelling polymer.
14. (original) The cartridge as in claim 1, 2, or 3, further comprising at least one constriction to control fluid flow within said first and second conduits.
15. (original) The cartridge as in claim 1, 2, or 3 wherein said second conduit further comprises a valve responsive to hydrostatic pressure.
16. (original) The cartridge as in claim 15, wherein said valve comprises a constriction in said conduit, wherein said constriction has a fluid-contacting surface comprising a hydrophobic surface.
17. (original) The cartridge as in claim 1, 2, or 3, further comprising a third conduit connecting said second conduit and an overflow chamber.
18. (original) The cartridge as in claim 1, 2, or 3, wherein said pump is selected from the group consisting of an air sac contacting a pneumatic means whereby pressure is applied to said air sac, a flexible diaphragm, a piston and cylinder, an electrodynamic pump, and a sonic pump.
19. (original) The cartridge of claim 1, 2, or 3, in which said analyte-responsive surface comprises an antibody.
20. (original) The cartridge as in claim 1, 2, or 3, wherein a portion of at least one conduit further comprise at least one dry reagent capable of dissolving in said fluid or sample.
21. (original) The cartridge as in claim 20 wherein said at least one dry reagent is an antibody-enzyme conjugate, a substrate for said antibody-enzyme conjugate, or a blocking agent.
22. (original) The cartridge as in claim 21 wherein said at least one antibody-enzyme conjugate comprises an enzyme that is urease, glucose oxidase, peroxidase, or alkaline phosphatase.
23. (original) The cartridge as in claim 22 wherein said substrate is urea, glucose, hydrogen peroxide, or a molecule having a phosphate or peroxide moiety.
24. (original) The cartridge as in claim 1, 2, or 3, wherein said at least one analyte sensor is an immunosensor.
25. (original) The cartridge as in claim 1, 2, or 3 wherein said fluid comprises a substrate for an antibody-enzyme conjugate.

26. (original) The cartridge as in claim 25 wherein said substrate is cleaved to produce an electroactive product.
27. (original) The cartridge as in claim 26 wherein said substrate is a ferrocene or p-aminophenol phosphate.
28. (original) The cartridge as in claim 1, 2, or 3, wherein said at least one analyte sensor is an amperometric sensor, a potentiometric sensor, or a reference sensor.
29. (currently amended) The cartridge as in claim 1, 2, or 3, further comprising one or more a ~~plurality of~~ mechanical and electrical connections for insertion of said cartridge into a reading apparatus.
30. (original) The cartridge as in claim 1, 2, or 3, wherein said at least one analyte sensor is formed on a substantially planar surface.
31. (original) The cartridge as in claim 1, 2, or 3, further comprising a surface coating that decreases non-specific binding of a substance therein.
32. (original) The cartridge as in claim 1, 2, or 3, further comprising an enzyme and a substrate capable of regenerating a product consumed by contact with said at least one analyte sensor, whereby a signal from said sensor is increased.
33. (original) The cartridge as in claim 32 wherein said enzyme is glucose oxidase and said substrate is D-glucose.
34. (original) The cartridge as in claim 1, 2, or 3, further comprising mobile microparticles capable interacting with said analyte and further comprising means for localizing said microparticles to said at least one sensor.
35. (original) The cartridge as in claim 34, wherein said microparticles are magnetic, and said means for localizing said microparticles is a magnet field.
36. (original) The cartridge as in claim 34, further comprising a filter element interposed between said sample holding chamber and said at least one analyte sensor, and adjacent said at least one sensor, whereby said microparticles are concentrated adjacent said at least one sensor.
37. – 55. (cancelled)
56. (currently amended) The cartridge of claim 1, 2, or 3, ~~or 48~~ wherein said sample holding chamber further comprises a closure means.
57. - 62. (cancelled)